REQUEST FOR PROPOSAL
Addendum # 7

King County
Department Of Executive Services
Finance and Business Operations Division
Procurement and Contract Services Section
206-684-1681 TTY RELAY: 711

ADDENDUM DATE: October 5, 2004

RFP Title: **On-Board Systems / Communication Center System**

RFP Number: **04-001PR**

Due Date/Time: **October 28, 2004 - 2:00 P.M.**

Buyer: Paul Russell, *paul.russell@metrokc.gov* , 206-684-1054

Q#	Subsection	QUESTION	ANSWER
Part C, APPENDIX P			
1.	Addendum # 6		**DELETE: Appendix P** **REPLACE WITH** Attached Appendix P

Appendix P

RFCS Project Equipment & Systems Architecture

Including the

DDU, WDOLS & OBFTP

Page 1 of 12 Pages

SECTION I: DRIVER DISPLAY UNIT

1 Introduction

1.1 - 1.3 *Intentionally deleted.*

1.4 Identification

The DDU is a driver interface unit intended for installation in mobile environments to interface with the OBFTP, other on-board Regional Fare Coordination System (RFCS) devices, and third-party equipment. It provides the following functions in conjunction with on-board systems:

A driver interface that includes:

- Transfer of logon and logoff information to on-board systems
  - Driver input through a keyboard
  - Visual feedback from an liquid crystal display (LCD) capable of displaying text and graphics
  - Audio feedback
  - An interface to fare transaction processors
- An interface to other RFCS devices
- An interface to third-party equipment, such as radios and destination displays
- Mounting to horizontal and vertical stanchions or flat surfaces, including but not limited to horizontal or vertical dashboard

Figure 1: DDU (Front View)

2 Hardware Design

2.1 Identification

There are two implementations of the DDU architecture: the Limited Integration Mode (LIM) and the Full Integration Mode (FIM). The proposed implementation of the LIM and FIM modes corresponds to the diagrams in Updates to the Contract.

System Diagram

An alternate on-board architecture has been presented to, and accepted by, the Agencies. That architecture is based on open hardware and software for the DDU such that the move from LIM to FIM is relatively simple, from both a hardware and software perspective.

Figure 2 shows the on-board system architecture in LIM.

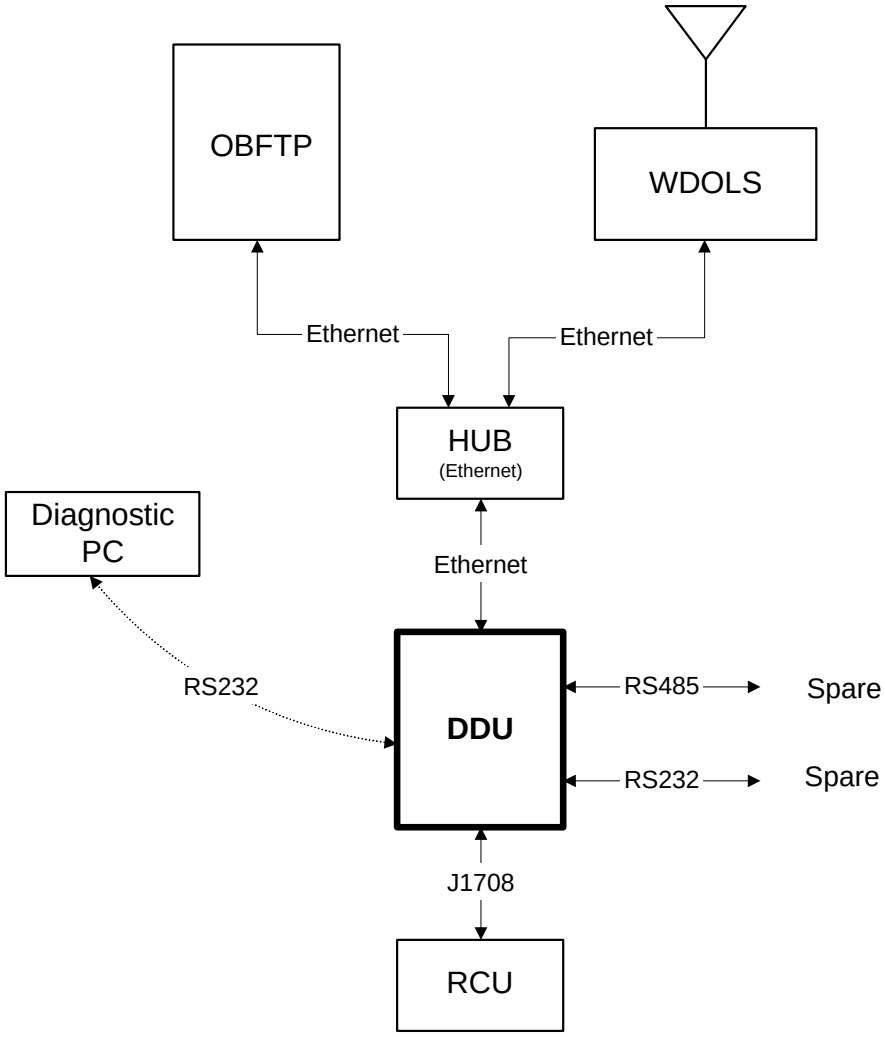

Figure 2: DDU System Architecture – LIM

Figure 3 shows the on-board system architecture in FIM when the Vehicle Logic Unit (VLU) is included.

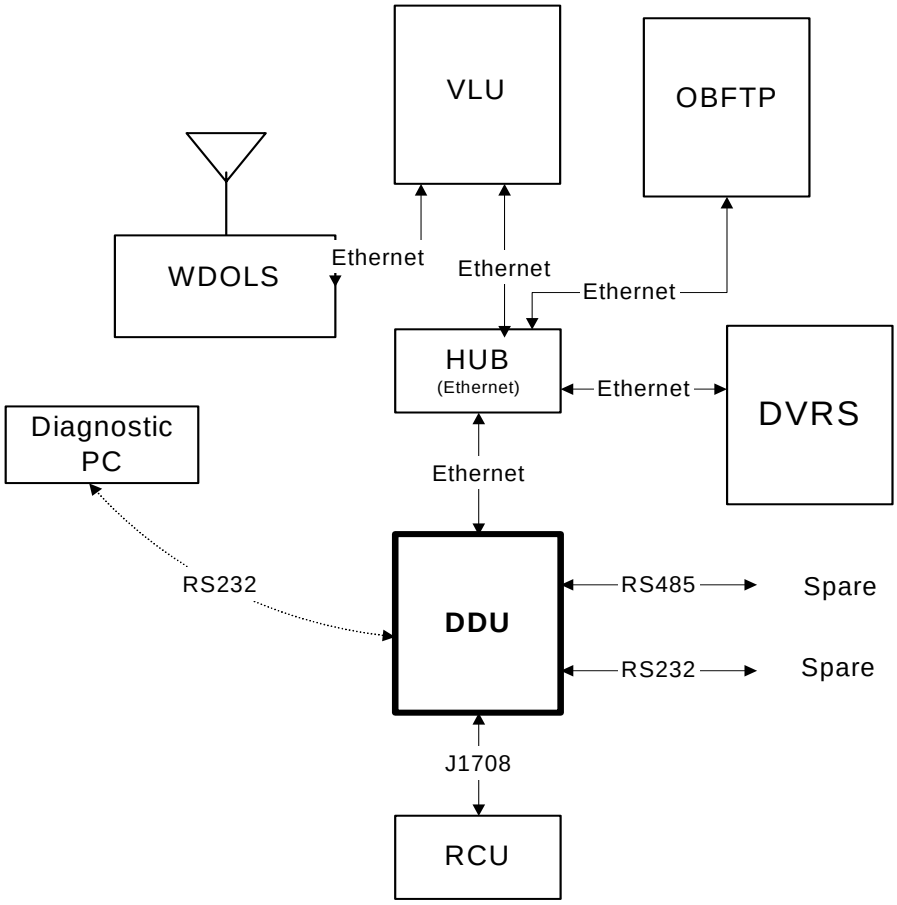

Figure 3: DDU System Architecture - FIM

The on-board architecture is such that FIM is an extension of LIM. That is, the addition of the VLU in FIM does not require change to the architecture of the existing LIM devices. Additionally, the open hardware and software platform for the DDU facilitates the replacement of the DDU with a DDU by others.

2.1.1 Limited Integration Mode (LIM)

A summary of the DDU interfaces shown in Figure 2 is provided in Table 1.

Table 1: DDU Module Interface Summary – LIM

WDOLS	RCU	OBFTP	Spare	Diagnostics	Spare
Ethernet	J1708	Ethernet	RS485	RS232	RS232

The hardware functionality and architecture of LIM includes:

- Interface of the DDU with the OBFTP for fare collection
- Interface of the DDU with the radio control unit (RCU) for King County Metro (KCM)
- A diagnostic port on the DDU for maintenance purposes

2.1.2 Full Integration Mode (FIM)

A summary of the DDU interfaces shown in Figure 3 is provided in Table 2.

Table 2: DDU Module Interface Summary - FIM

WDOLS	RCU	OBFTP	Spare	VLU	Diagnostics	Spare
Ethernet	J1708	Ethernet	RS485	Ethernet	RS232	RS232

The hardware functionality and architecture of FIM includes:

- Interface of the DDU with the OBFTP for fare collection
- Interface of the DDU with the RCU for KCM
- Interface of the DDU with the VLU for other on-board systems
- A diagnostic port on the DDU for maintenance purposes

3. Functionality Design

3.1 External Interfaces

Figure 4 Illustrates the DDU external software interfaces.

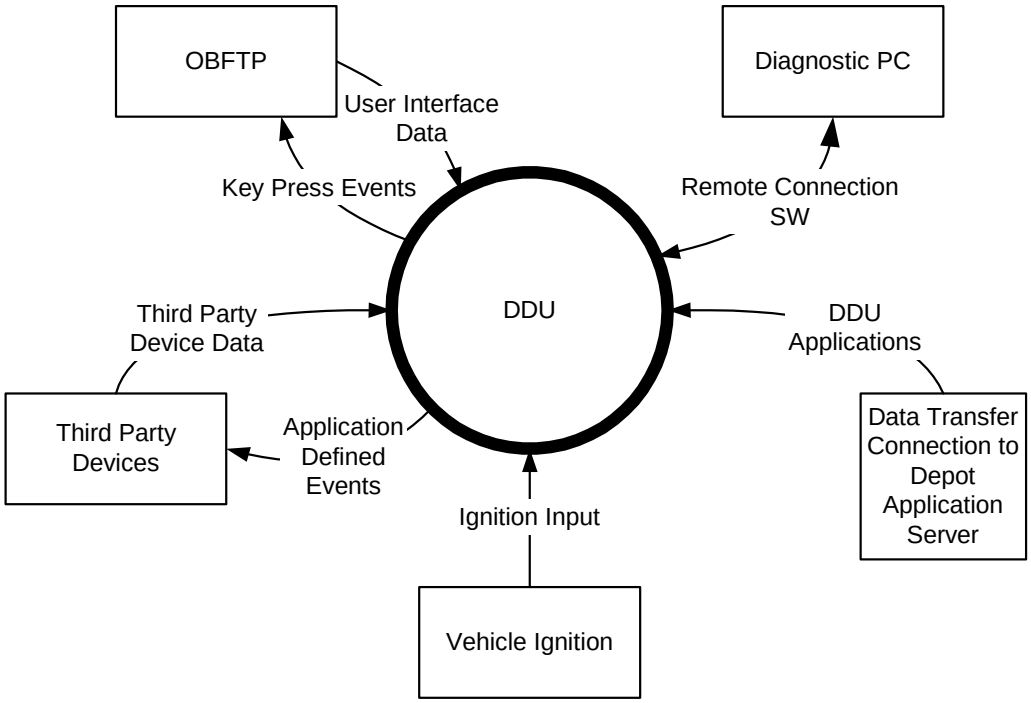

Figure 4: DDU External Software Interfaces

The DDU communicates with the following external devices:

- OBFTP (through Ethernet)
- Diagnostic PC (through RS232)
- Third-party devices: VLU, RCU (through J1708), RS485 Spare, RS232 Spare

3.2 - 3.5 *Intentionally deleted.*

3.6 Application Certification

As described, third-party applications are required to be certified by ERG prior to being downloaded to and run on the DDU. Only applications that have been certified are added to the DDU application manifest as part of OBFTP CD and can be loaded or run on the DDU.

There are two components of third-party design that require certification, namely:

- **Applications for third party devices**
  These are the applications to be run on the DDU. Applications are downloaded using a direct mechanism, such as through a secure FTP connection to an application server at the depot.
- **Templates designed or modified by Agencies**
  The DDU templates can be customized for each Agency and provide the mechanism to control DDU display arrangements and the assignment of soft-key functionality. Unlike the third-party applications, the templates do form part of system CD and are downloaded to the VLU, OBFTP and then onto the DDU.

3.6.1 Application Guidelines

Any third-party applications to be written for the DDU must adhere to the framework provided by the DDU application architecture. That is, the applications must be written to:

- Use facilities provided by the template manager to obtain access to the display, keypad, and audio resources of the DDU. This ensures that all resources can be shared by all applications, taking into consideration the provision for assignment of priorities to applications
- Use facilities provided by the status and logging application to provide particular status and event information to the driver. This enables existing templates employing the status and logging application to be used unchanged, even when new third-party applications are added in the future
- Make use of the data generated by the logon/logoff application

Certification involves verifying the following factors for any applications modified or new applications created:

- Build documentation reflects that applications are built for a standard Windows CE.net environment, and that the application is compatible with the hardware specifications of the DDU.
- Design documentation declares compliance with template guidelines for interfacing with DDU resources.
- Code walk-through demonstrates correct interface with DDU resources.
- The amount of device memory required or used is acceptable given requirements by other applications and available memory. DDU memory can be increased on an as needed basis subject to agreement between ERG and the Agencies.
- The application does not use processor or resource locking calls that could prevent other applications from performing correctly.
- The application loads correctly, can be launched by the application manager, and does not cause any other applications to become inoperable.

- The application operates correctly with the other base DDU applications, such as the logon/logoff application, the status and logging applications, and others.
- According to the functional specification of the application, that all functions operate as required. A functional test specification for each application is required that declares boundary tests, and tests for all interfaces used by the application.

Note: Along with the introduction of a new application, the top-level DDU template will require modification to add a link to a new template required by the application. Additionally, changes to other existing templates may be required if the agency requires new application functions or message displays to be incorporated into these templates, or for links to the new application template to be added.
For the functional testing of the new application, the new application template is tested at the same time. That is, tests are performed to verify that all soft-key functions are accessible and operate correctly, and that all message displays are correct. Additionally, where existing templates have been changed, tests are performed to verify that existing functions on these templates continue to operate as before; that is, all functionality is still accessible and operates correctly.

3.6.2 Template Guidelines

When any new templates are defined or existing templates are modified, they must also be certified, even if there are no new applications.

An application front-end will be provided to generate the DDU template file. This will enforce a number of restrictions, such as preserving particular fare collection templates and defining global soft-key definitions. This application also ensures that any DDU template file will be complete and be parsed correctly by the template manager.

Although the arrangement of application windows and soft-key assignments is configurable by each agency, care is required to ensure that access to application data is not lost be resizing of application windows, or that functionality is not lost by reassignment of soft-keys.

Note: ERG proposes the reservation of 2 of the 12 soft keys located on the DDU sides for navigational purposes. These 2 keys would provide the functionality to return to the top level screen and previous screen respectively. This is subject to design approval, and could be incorporated into the certification process.

- Application windows are not resized smaller than requirements for that application. Exceptions to this rule apply when clipped windows are acceptable, or when applications are intelligent and can resize window content to suit window sizing.
- If fewer than the total number of soft keys required by an application are assigned on a template, then a soft key should be assigned to allow switching to a different template that has the correct number of soft keys required by the application.
- Provision is provided on all templates to allow sensible and logical transition between templates.

End of Section I: Driver Display Unit

SECTION II: WIRELESS DATA ON/OFF LOADING SYSTEM

1 - 2 *Intentionally deleted.*

3 Network Configuration

Please see information about the hardened Cisco Aironet 1300 Workgroup Bridge at: *http://www.cisco.com/en/US/products/ps5861/index.html*

This unit:

- Requires static, unique IP addresses (potentially RFCS-wide) for all RFCS on-board OBFTP and DDU devices, so multiple vehicles can connect to land-based networks via the DAC while retaining the ability to communicate privately on their own on-board LAN. This is further reinforced by the need for the bus equipment to operate in degraded modes, when some on-bus equipment may not be functional.
- Commercial product is designed for vehicle installation, including environmental considerations.

The Cisco Aironet 1300 Series Access Point and Cisco Aironet 1300 Workgroup Bridge are the basis for establishing and securing the wireless network between onboard equipment and bus depot servers.

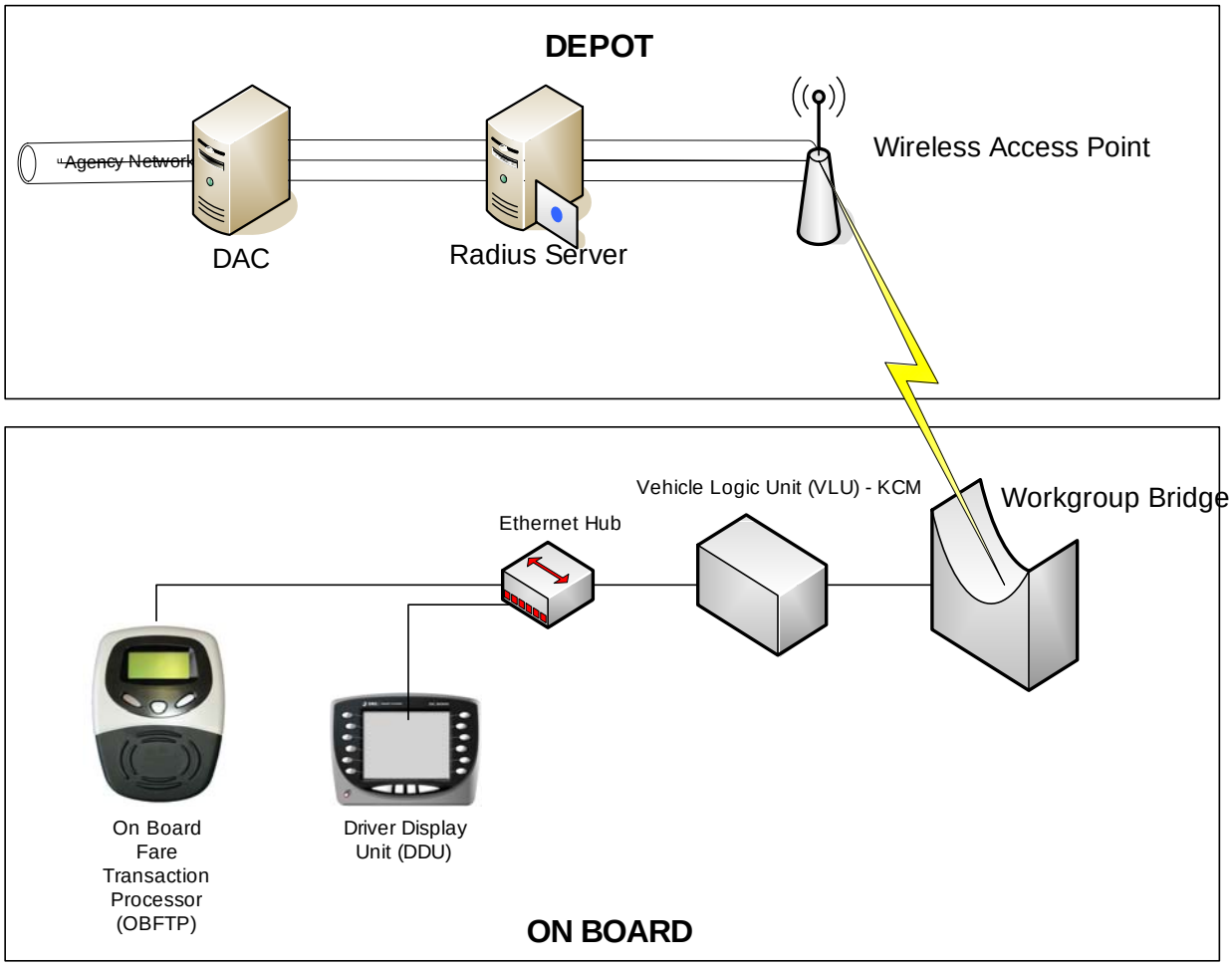

Figure 5: Typical WDOLS System Configuration

Note that during the actual deployment of LIM; the DAC, firewall and RADIUS server may differ from Agency to Agency (this is part of the ongoing integration and deployment discussions with each Agency). Note that in FIM the Radius Server will be a King County provided function. In general the logical configuration is like the one in Figure 5.

In general, no wireless client will have an access past the Access Point unless authorized via a RADIUS server (using LEAP/PEAP/Certs). The Access Point will connect to the Network. In LIM, the DAC will have appropriate firewall functionality to limit attacks or unwanted network activity initiated from the wireless network into the rest of the Agency network. In FIM, King County will take over managing the authentication and access functions.

4 - 7.1 *Intentionally deleted.*

7.2 Vehicle Data Communications

The on-board equipment will be connected using an internal vehicle LAN. The WDOLS will be the transparent node by which discrete on-board devices will access the Agency network (via the Access Point). RADIUS authentication of the wireless connection request will be required, using the username/password injected into the WDOLS in LIM and possibly FIM.

On-board communications, relevant for the WDOLS operation, will include:

- OBFTP to DDU screen and event exchange (TCP/IP).
- DDU application to device communications (specific to that particular application and device, using the on-bus LAN).
- In LIM, on-board devices communicating with Agency networks (via the WDOLS acting as a bridge).
- In FIM, on-board devices will communicate through the DHCP IP Addressed VLU to the WDOLS via tunneling. The WDOLS IP Address will be a DHCP Assigned address from the BASE (Fixed end) Servers.

End of Section II: Wireless Data On/Off Loading System

SECTION III: FARE TRANSACTION PROCESSOR

1 *Intentionally deleted.*

2 Hardware Design

2.1 Identification

The OBFTP is a mobile (i.e. on-board), integrated, contactless smart card fare processing unit, intended for installation onto buses. The OBFTP may operate independently from a DDU or other on-board systems to process transactions (subject to setup). In a normal usage scenario however, the OBFTP operates in conjunction with a DDU and other on-board systems. The OBFTP provides the following hardware functionality:

- An OBFTP display that includes:
  - Ability to read and write (encode) a fare card.
  - Visual feedback from a display capable of displaying alphanumeric text and graphics.
  - Visual feedback from red, yellow and green colored LEDs.
  - Audio feedback of transaction status.
- A contactless smart card reader/writer.
- An interface to the DAC via the WDOLS for download of applications and configuration data, and upload of usage data.
- Diagnostic capability by local connection to a PC.
- Interface with onboard systems in limited integration mode (LIM) and fully integrated mode (FIM) implementations.
- Interface with the Driver Display Unit (DDU).
- Horizontal or vertical stanchion mounting, or surface mounting.

Figure 6: OBFTP Processor

3 Functionality Design

3.1 Introduction

The OBFTP application is designed to perform the following basic functions:

- Perform an OBFTP system self-test at startup to ensure that all sub-systems are functioning correctly and report any faults encountered (where possible).
- Allow authorized logon for operation and diagnostics.
- Maintain time and date information.
- Accept operational commands via the DAC.
- Download and store CD from the DAC.
- Process transactions in accordance with business rules and CD.
- Store details of transactions and events (including non fare card ridership) as UD.
- Upload UD to the DAC.
- Display messages to the operator and to cardholders.
- Display status indications to the operator and to cardholders.
- Provide audio feedback to the operator and to cardholders.

- Monitor memory usage and prevent further transactions if memory is full.
- Monitor device status and attempt to log and report on faults.

3.2 *Intentionally deleted.*

3.3 Device Role

The OBFTP provides the following major functionality:

- An OBFTP display to provide a payment acceptance peripheral for the automatic processing of fare card and non fare card transactions and feedback on the outcome of those transactions.
- In LIM, has a communications interface to a DAC (via WDOLS) to transfer CD, UD and messages. An alternate data path via a diagnostic computer connected to the diagnostic port provides this functionality in the case of failure of the primary communications interface.
- In FIM, has a communications interface to the VLU and is “tunneled” to the DAC via the WDOLS device attached to the VLU. An alternate data path via a diagnostic computer connected to the diagnostic port provides this functionality in the case of failure of the primary communications interface
- Provide DDU with DDU manifest and access control data for WDOLS and manual logon.

End of Section III: Fare Transaction Processor